IN THE CLAIMS:

Claim 35 has been amended. The following listing of claims will replace all previous versions of the claims.

1. **(Previously presented)** A method for determining changes in a reactant supply system that is designed to supply repeated pulses of a vapor phase reactant to a reaction chamber, the method comprising:

providing a reactant source;

providing a gas conduit system to connect the reactant source to the reaction chamber;

providing a valve positioned in the gas conduit system such that switching of the valve induces vapor phase reactant pulses from the reactant source to the reaction chamber;

repeatedly switching the valve to induce repeated vapor phase reactant pulses;

providing a first sensor that is in communication with the conduit system at a point upstream of the reaction chamber and downstream of the reactant source, the first sensor providing a first signal indicative of a first characteristic parameter of the reactant pulses as a function of time;

generating a first curve having a shape from the first signal for the repeated reactant pulses; and

monitoring the shape of the first curve to determine changes in the shape of the first curve over time, the changes in the shape of the first curve being indicative of changes in a supply of repeated reactant pulses to the reaction chamber.

2. **(Original)** The method as in claim 1, further comprising:

providing a second sensor that is in communication with the gas conduit system and provides a second signal indicative of a second characteristic parameter of the reactant pulse as a function of time;

generating a second curve having a shape from the second signal of the second sensor for repeated reactant pulses; and

monitoring the shape of the second curve derived from the second signal of the second sensor to determine changes in the shape of the second curve between

subsequent reactant pulses, the changes in the shape of the second curve being indicative of changes in the supply of repeated reactant pulses to the reaction chamber.

3. **(Original)** The method as in claim 2, further comprising discriminating among:

a first condition, wherein the shape of the first curve changes significantly and the shape of the second curve remains substantially unchanged;

a second condition, wherein the shape of the second curve changes significantly and the shape of the first curve remains substantially unchanged; and

a third condition, wherein the shape of the first and second curves change significantly.

4. **(Original)** The method as claim 1, further comprising using pattern recognition methodology software to characterize the shape of said first curve and to determine if there are significant changes in the shape of the first curve over subsequent reactant pulses.

5. **(Original)** The method as in claim 1, further comprising generating an alarm signal when the shape of the first curve changes beyond a predetermined level.

6. **(Original)** The method as in claim 1, further comprising providing a feed-back control loop between the first sensor and the valve such that, upon a detected change in the shape of the first curve, the switching of the valve is changed such that a desired reactant mass per pulse is obtained.

7. **(Original)** The method as in claim 1, wherein providing a first sensor comprises providing a pressure sensor.

8. **(Original)** The method as in claim 1, wherein providing a reactant source comprises providing a liquid or solid phase reactant.

9. **(Original)** The method as in claim 8, further comprising providing a source of carrier gas that is connected to the reactant source through a carrier gas conduit.

10. **(Original)** The method as in claim 9, further comprising positioning the valve in the carrier gas conduit upstream of the reactant source and switching the valve induces carrier gas pulses from the carrier gas source to the reactant source.

11. **(Original)** The method as in claim 9, further comprising positioning the first sensor to measure a first characteristic parameter of the carrier gas pulse.

12. **(Original)** The method as in claim 1, wherein atomic layer deposition is conducted in the reaction chamber.

13. **(Original)** The method as in Claim 1, wherein the first characteristic parameter comprises a vibration in a valve.

14. **(Previously presented)** An apparatus for supplying repeated vapor phase reactant pulses to a reaction chamber, the apparatus comprising:

a reactant source;

a gas conduit system that connects the reactant source and the reaction chamber;

a valve positioned in the gas conduit system such that switching of the valve induces vapor phase reactant pulses from the reactant source to the reaction chamber;

a first sensor that is in communication with the gas conduit system at a position upstream of the reaction chamber and provides a first signal indicative of a first characteristic parameter of the reactant pulses at the position upstream of the reaction chamber as a function of time; and

a diagnostic and control unit that is configured to generate a first curve from the first sensor and to monitor changes over time in a shape of the first curve during subsequent reactant pulses.

15. **(Original)** The apparatus as in claim 14, further comprising a second sensor that is in communication with the gas conduit system and provides a second signal indicative of a second characteristic parameter of the reactant pulses as a function of time, wherein the diagnostic and control unit is configured to generate a second curve from the second sensor and to monitor changes over time in a shape of the second curve during subsequent reactant pulses.

16. **(Original)** The apparatus as in claim 15, wherein the diagnostic and control unit is configured to discriminate among:

a first condition, wherein the shape of the first curve changes significantly and the shape of the second curve remains substantially unchanged;

a second condition, wherein the shape of the second curve significantly and the shape of the first curve remains substantially unchanged; and

a third condition wherein the shapes of the first and second curves change significantly.

17. **(Original)** The apparatus as claim 14, wherein the diagnostic and control unit is configured to use pattern recognition methodology software to characterize the shape of the first curve and to determine if there are significant changes over time in the shape of the first curve during subsequent reactant pulses.

18. **(Original)** The apparatus as in claim 14, wherein the diagnostic and control unit includes an alarm and is configured to activate the alarm when the shape of the first curve changes beyond a predetermined level.

19. **(Original)** The apparatus as in claim 14, comprising a feed-back control loop between the first sensor and the valve, the feed-back control loop being configured such that, upon a detected change in the shape of the first curve, the switching of the valve is changed such that a desired reactant mass per pulse is obtained.

20. **(Original)** The apparatus as in claim 1, wherein the first sensor is a pressure sensor.

21. **(Original)** The apparatus as in claim 1, wherein the reactant source is a liquid or solid phase reactant.

22. **(Original)** The apparatus as in claim 21, comprising a source of carrier gas that is connected to the reactant source through a carrier gas conduit.

23. **(Original)** The apparatus as in claim 22, wherein the valve is positioned in the carrier gas conduit upstream of the reactant source such that switching the valve induces carrier gas pulses from the carrier gas source to the reactant source.

24. **(Original)** The apparatus as in claim 22, wherein the first sensor is positioned to measure a first characteristic parameter of the carrier gas pulses.

25. **(Previously presented)** A method for determining changes in a reactant supply system that is designed to supply repeated pulses of a vapor phase reactant to a reaction chamber of an ALD system, the method comprising:

providing a reactant source that comprises a solid and/or liquid reactant and a vaporizing mechanism;

providing a conduit system to connect the reactant source to the reaction chamber and to connect a purging gas source to the reaction chamber;

providing at least one valve positioned in the conduit system such that switching of the valve induces alternating vapor phase reactant pulses from the reactant source to the reaction chamber and purging pulses from the purging gas source;

repeatedly switching the valve to induce repeated alternating vapor phase reactant and purging pulses;

providing a first sensor that is in communication with the gas conduit system and provides a first signal indicative of a first parameter in the gas conduit system;

generating a first curve from the first signal as a function of time, the first curve having a shape characteristic of the repeated vapor phase reactant and purging pulses while the reactant and purging pulses are being supplied to the reaction chamber;

monitoring the shape of the first curve to determine changes indicative of changes in a supply of repeated reactant pulses to the reaction chamber; and

in response to the changes in the shape of the first curve, replacing the reactant source with a second reactant source that comprises a solid and/or liquid reactant and a vaporizing mechanism.

26. **(Original)** The method as in claim 25, further comprising:

providing a second sensor that is in communication with the conduit system and provides a second signal indicative of a second parameter;

generating a second curve from the second signal as a function of time, the second curve having a shape characteristic of the repeated reactant and purging pulses; and

monitoring the shape of the second curve to determine changes indicative of changes in the supply of repeated reactant pulses to the reaction chamber.

27. **(Currently amended)** The method as in claim [[**25**]] <u>26</u>, wherein the first parameter is a pressure and the second parameter is a mass flow rate.

28. **(Original)** The method as in claim 27, further comprising discriminating among:

a first condition, wherein the shape of the first curve changes significantly and the shape of the second curve remains substantially unchanged;

a second condition, wherein the shape of the second curve changes significantly and the shape of the first curve remains substantially unchanged; and

a third condition, wherein the shapes of the first and second curves change significantly.

29. **(Original)** The method as claim 25, further comprising using pattern recognition methodology software to characterize the shape of the first curve and to determine if there are significant changes in the shape of the first curve over time during subsequent reactant and purging pulses.

30. **(Original)** The method as in claim 29, further comprising generating an alarm signal when the shape of the first curve changes beyond a predetermined level.

31. **(Original)** The method as in claim 29, further comprising providing a feedback control loop between the first sensor and the valve such that, upon a detected change in the shape of the first curve, the switching of the valve is changed such that the shape of the first curve regains its original shape.

32. **(Original)** The method as in claim 25, wherein providing a first sensor comprises providing a pressure sensor.

33. **(Original)** The method as in claim 25, wherein the valve is positioned in the gas conduit system upstream of the reactant source and wherein switching the valve induces carrier gas pulses from a carrier gas source to the reactant source.

34. **(Original)** The method as in claim 33, further comprising positioning the first sensor to measure the pressure of the carrier gas pulse.

35. **(Currently amended)** A method for determining changes in an amount of reactant in a first reactant source within an atomic layer deposition (ALD) system, the method comprising:

monitoring pressure in a conduit that communicates with a reactant source container in the ALD system;

generating a pressure signal corresponding to the monitored pressure during at least a first ALD cycle comprising a pulse of a first reactant and a pulse of a second reactant and at least a second ALD cycle separated in time from the first

ALD cycle and comprising a pulse of the first reactant and a pulse of the second reactant; [[and]]

comparing a pattern of the pressure signal over time during at least a portion of the first ALD cycle to a pattern of the pressure signal over time during at least a portion of the second ALD cycle; and

measuring if there is a significant difference in the pattern of the pressure signal between the first ALD cycle and the second ALD cycle to determine the amount of the first reactant in the first reactant source.

36. **(Canceled)**

37. **(Original)** The method as in claim 35, wherein the reactant source container includes a vapor phase reactant and a non-vapor phase reactant that is in communication with the vapor phase reactant.

38. **(Previously presented)** The method as in claim 35, further comprising determining if the non-vapor phase reactant in the reactant source container is depleted, at least in part, upon changes in the pattern of the pressure between the at least first and the at least second ALD cycles.

39. **(Currently amended)** The method as in claim 35, further comprising determining if a valve or conduit in the ALD system is damaged or worn at least, at least in part, upon changes in the pattern of the pressure between the at least first and the at least second ALD cycles.

40. **(Original)** The method as in claim 35, further comprising monitoring a second characteristic parameter in a conduit of the ALD system and comparing a pattern of the second characteristic parameter during at least a first ALD cycle to a pattern of the second characteristic parameter during a second ALD cycle.

41. **(Previously presented)** The method of claim 40, wherein the second characteristic parameter comprises a current or voltage signal of a convection sensor downstream of the reactant source container.

42. **(Previously presented)** The method of claim 40, wherein the second characteristic parameter comprises vibrations measured at a valve repeatedly switching within the conduit.

43. **(Original)** The method of claim 42, wherein the vibrations comprise sounds.